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ABSTRACT

The teaching activity presented in this paper focuses on giving students in grades four through seven a headstart on future computer classes, and provides a practical way for students to use language and logic. The paper presents a step-by-step lesson in flowcharting, including discussions of the special purposes for various shapes in a chart, such as rectangles for directions to follow, circles for starting and stopping, and diamonds for yes or no decisions. It then presents the steps for a specific task, from which students working in small groups can construct the appropriate flowchart, and an empty diagram, into which students can insert the appropriate steps. (HTH)

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Feature Project--The Language of Flowcharting

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Feature Project

The Language of Flowcharting

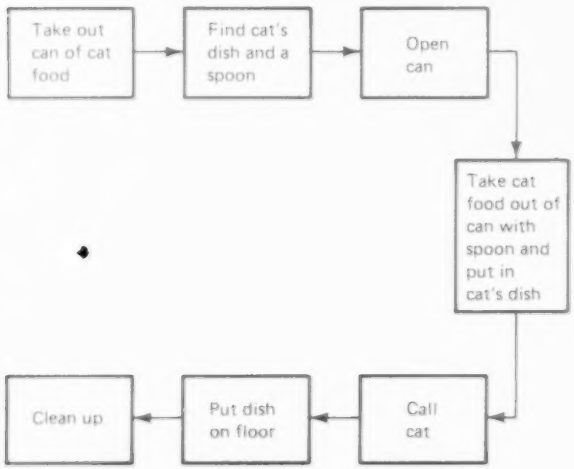
GRADE LEVEL: 4–7

PURPOSE:
- to learn the concept of flowcharting
- to think and talk about the steps required to do several simple tasks
- to draw a flowchart
- to use words precisely
- to determine the proper order of a series of steps

MATERIALS:
- 8½" × 11" rectangles of posterboard
- paper, pencils, and markers
- a sample set of cards, each listing one in a series of steps necessary to perform a task

In computer programming, a flowchart allows the programmer to diagram the step-by-step progression through a complicated procedure. A lesson in flowcharting gives your students a headstart on future computer classes—and just as importantly, it provides a practical way to use language and logic.

The following activity is apt to take from three to four class periods. Start by explaining to students that drawing a flowchart is a way to divide a task into simple steps. The flowchart is a picture that shows the steps in correct order. (To simplify the introduction to flowcharting, all steps in the flowcharts are at first represented by rectangles only.) Copy the following example on the chalkboard or on a sheet of clear plastic for use with an overhead projector. Point out that the boxes could be arranged in other ways, but that for this flowchart, this particular arrangement takes up the least space.


Take out can of cat food
Find cat's dish and a spoon
Open can
Take cat food out of can with spoon and put in cat's dish
Call cat
Put dish on floor
Clean up

To begin the activity, divide the class into small groups and assign each group a simple task to be flowcharted, such as:

How to sharpen a pencil
How to set a table
How to make a bed
How to fill a glass of water
How to make orange juice from frozen concentrate
How to put a shirt on a hanger

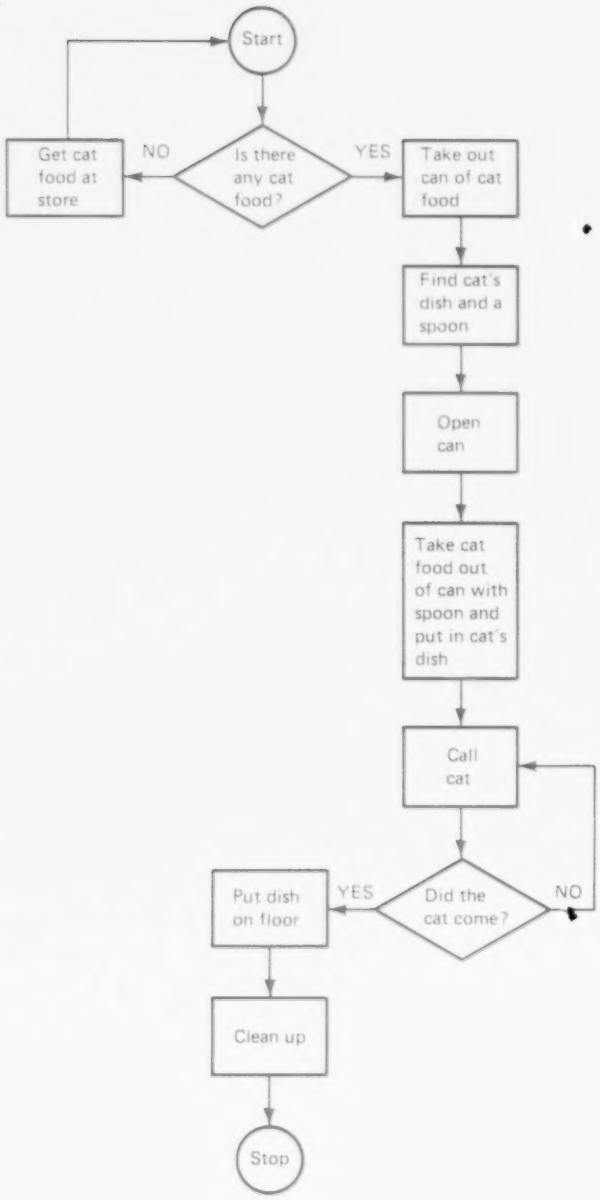
Next, give each group eight to ten posterboard cards. Ask students to talk about the steps necessary for doing the task, and then to write simple instructions, not to exceed ten steps. Advise students to write the steps on a separate sheet of paper and to transfer them to the cards when they have all agreed on wording and sequence. Only one step may be listed on each card, and the words should be printed clearly, as large as possible. If students wish to number the cards, they should do so on the back. When students are finished preparing their cards, ask them to mix up the order of their cards.

Now, the members of one group bring their cards to the front of the class, and the rest of the students determine the proper order. The group members hold the cards up in front of the class in a line from left to right, or else one member of the group tapes the cards to the chalkboard in their current mixed order. Another group member reads the steps aloud slowly from left to right. To suggest a different order, students in the audience raise their hands to be called on, read aloud the step they think should be moved, and describe where they think it should be placed in the sequence and why. (You can mention to your students that these simple practice examples may be ordered in more than one way, but in more complicated flowcharting the order is less flexible.) The members of the original group tell the class when the series is ordered properly, and then it is time for another group to take a turn.

When all the groups have had a turn, you can introduce students to additional flowcharting symbols: the circle and the diamond. Use the diagram below to show students the special purposes for the various shapes.

directions to follow starting or stopping yes or no decisions

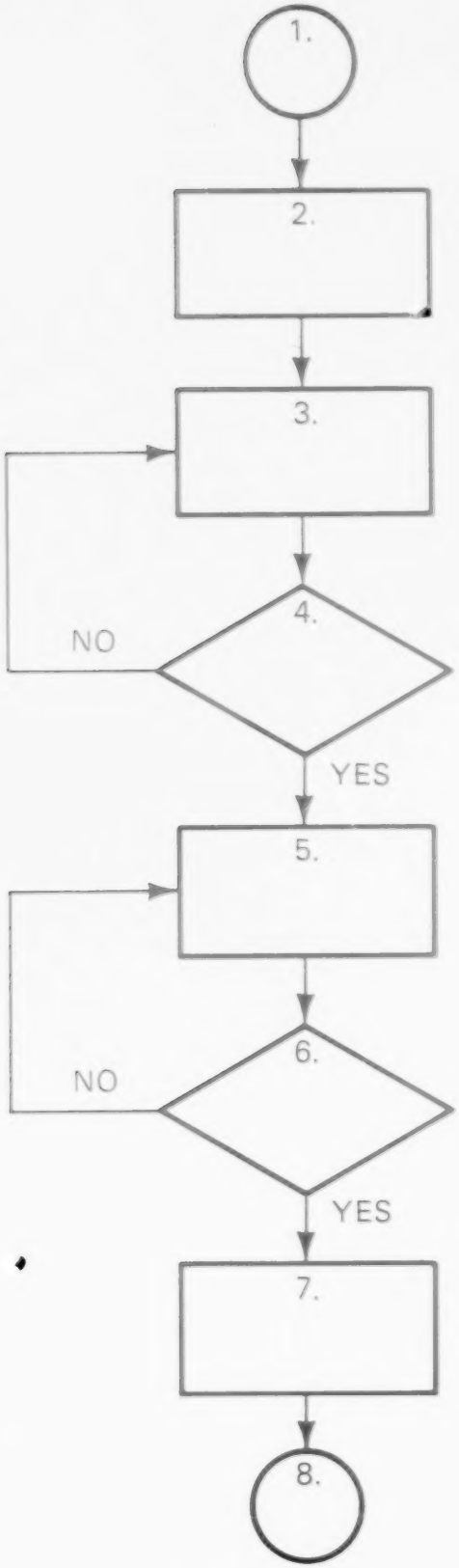
Next, draw the following example on the board to show students how *starting and stopping* and *yes or no decisions* are built into a flowchart.



To give students practice using the new shapes, distribute copies of the handout on page 9, and ask students to suggest the proper placement within the flowchart for the steps listed. The correct order for the steps is shown below.

1. Start
2. Stand at bus stop
3. Look for bus
4. Is bus coming?
5. Wait for bus to stop
6. Has bus stopped?
7. Get on bus
8. Stop

A Flowchart for Getting on a Bus



These eight steps are not in the right order. Decide on the best order and copy each step onto the flowchart in the right place.

Get on bus

Has bus stopped?

Is bus coming?

Look for bus

Stand at bus stop

Stop

Start

Wait for bus to stop

When students feel comfortable using the new concepts, you may want to ask each group to design a revised flowchart for their original task, adding extra steps for starting and stopping and for yes or no decisions. After students cut extra cards into circles and diamonds for the added steps, the student groups are again ready to challenge the rest of the class to determine the proper placement for the steps in their flowcharts.

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